

EXHIBIT B

Juvenile Justice Center

American Bar Association

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Cruel and Unusual Punishment: The Juvenile Death Penalty

Adolescence, Brain Development and Legal Culpability

"[They] frequently know the difference between right and wrong and are competent to stand trial. Because of their impairments, however, by definition they have diminished capacities to understand and process mistakes and learn from experience, to engage in logical reasoning, to control impulses, and to understand the reactions of others.... Their deficiencies do not warrant an exemption from criminal sanctions, but they do diminish their personal culpability."

Atkins v. Virginia, 536 U.S. 304, 318,
122 S.Ct. 2242, 2250 (2002)

In 2002, the U.S. Supreme Court banned the execution of mentally retarded persons. This decision, *Atkins v. Virginia*, cited the underdeveloped mental capacities of those with mental retardation as a major factor behind the Justices' decision.

Adolescence is a transitional period during which a child is becoming, but is not yet, an adult. An adolescent is at a crossroads of changes where emotions, hormones, judgment, identity and the physical body are so in flux that parents and even experts struggle to fully understand.

As a society, we recognize the limitations of adolescents and, therefore, restrict their privileges to vote, serve on a jury, consume alcohol, marry, enter into contracts, and even watch movies with mature content. Each year, the United States spends billions of dollars to promote drug use prevention and sex education to protect youth at this vulnerable stage of life. When it comes to the death penalty, however, we treat them as fully functioning adults.

The Basics of the Human Brain

The human brain has been called the most complex three-pound mass in the known universe. This is a well deserved reputation, for this organ contains billions of connections among its parts and governs countless actions, involuntary and voluntary, physical, mental and emotional.

The largest part of the brain is the *frontal lobe*. A small area of the frontal lobe located behind the forehead, called the *prefrontal cortex*, controls the brain's most advanced functions. This

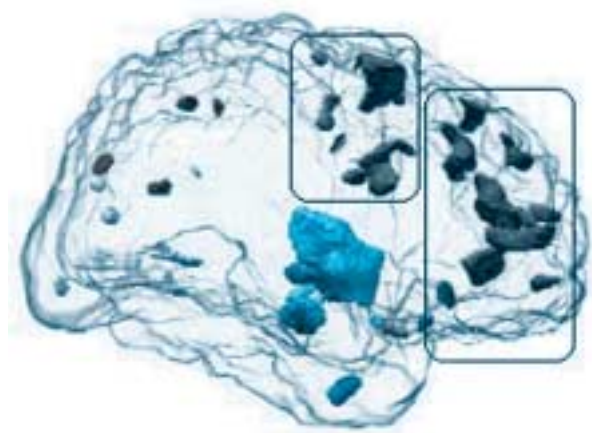
part, often referred to as the "CEO" of the body, provides humans with advanced cognition. It allows us to prioritize thoughts, imagine, think in the abstract, anticipate consequences, plan, and control impulses.

Along with everything else in the body, the brain changes significantly during adolescence. In the last five years, scientists, using new technologies, have discovered that adolescent brains are far less developed than previously believed.

New Technology, New Discoveries

Scientists are now utilizing advances in magnetic resonance imaging (MRI) to create and study three-dimensional images of the brain without the use of radiation (as in an x-ray). This breakthrough allows scientists to safely scan children over many years, tracking the development of their brains.¹

Researchers at Harvard Medical School, the National Institute of Mental Health, UCLA, and others, are collaborating to "map" the development of the brain from childhood to adulthood and examine its implications.



A three dimensional "map" showing portions of gray matter "pruned" from the brain between adolescence and adulthood. The dark portions in the two boxes indicate sections that will be discarded from the **frontal lobe**. The box on the far right indicates the **prefrontal cortex**, a subsection of the frontal lobe that controls judgment.

Image adapted from *Nature Neuroscience*.



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The scientists, to their surprise, discovered that the teenage brain undergoes an intense overproduction of *gray matter* (the brain tissue that does the “thinking”). Then a period of “pruning” takes over, during which the brain discards gray matter at a rapid rate.² This process is similar to pruning a tree: cutting back branches stimulates health and growth.

In the brain, pruning is accompanied by *myelination*, a process in which *white matter* develops. White matter is fatty tissue that serves as insulation for the brain’s circuitry, making the brain’s operation more precise and efficient.³

Researchers have carefully scrutinized the pace and severity of these changes and have learned that they continue into a person’s early 20s. Dr. Elizabeth Sowell, a member of the UCLA brain research team, has led studies of brain development from adolescence to adulthood. She and her colleagues found that the frontal lobe undergoes far more change during adolescence than at any other stage of life.⁴ It is also the last part of the brain to develop, which means that even as they become fully capable in other areas, adolescents cannot reason as well as adults: “[m]aturation, particularly in the frontal lobes, has been shown to correlate with measures of cognitive functioning.”⁵

Biology and Behavior

Jay Giedd, a researcher at the National Institute of Mental Health, explains that during adolescence the “part of the brain that is helping organization, planning and strategizing is not done being built yet.... It’s sort of unfair to expect [adolescents] to have adult levels of organizational skills or decision making before their brain is finished being built.”⁶

Dr. Deborah Yurgelun-Todd of Harvard Medical School has studied the relation between these new findings and teen behavior and concluded that adolescents often rely on emotional parts

of the brain, rather than the frontal lobe. She explains, “one of the things that teenagers seem to do is to respond more strongly with gut response than they do with evaluating the consequences of what they’re doing.”⁷

Also, appearances may be deceiving: “Just because they’re physically mature, they may not appreciate the consequences or weigh information the same way as adults do. So we may be mistaken if we think that [although] somebody looks physically mature, their brain may in fact not be mature.”⁸

This discovery gives us a new understanding into juvenile delinquency. The frontal lobe is “involved in behavioral facets germane to many aspects of criminal culpability,”⁹ explains Dr. Ruben C. Gur, neuropsychologist and Director of the Brain Behavior Laboratory at the University of Pennsylvania. “Perhaps most relevant is the involvement of these brain regions in the control of aggression and other impulses.... If the neural substrates of these behaviors have not reached maturity before adulthood, it is unreasonable to expect the behaviors themselves to reflect mature thought processes.

“The evidence now is strong that the brain does not cease to mature until the early 20s in those relevant parts that govern impulsivity, judgment, planning for the future, foresight of consequences, and other characteristics that make people morally culpable.... Indeed, age 21 or 22 would be closer to the ‘biological’ age of maturity.”¹⁰

Other Changes in the Body

In addition to the profound physical changes of the brain, adolescents also undergo dramatic hormonal and emotional changes. One of the hormones which has the most dramatic effect on the body is testosterone. Testosterone, which is closely associated with aggression, increases tenfold in adolescent boys.¹¹

“Just because they’re physically mature, they may not appreciate the consequences or weigh information the same way as adults do. So, [although] somebody looks physically mature, their brain may in fact not be mature.”

Deborah Yurgelun-Todd, PhD
Brain Imaging Laboratory,
McClean Hospital
Harvard University Medical School

Emotionally, an adolescent “is really both part child and part adult,”¹² explains Melvin Lewis, an expert in child psychiatry and pediatrics at Yale University School of Medicine. Normal development at this time includes self-searching, during which the adolescent tries to grow out of his or her childlike self. This change is complicated by the conflict between an adolescent’s new sense of adult identity and remaining juvenile insecurities.

The behaviors associated with this process include self-absorption, a need for privacy, mood swings, unique dress, and escapism, such as video games, music, and talking on the phone, as well as riskier behaviors, such as drug use or sexual activity.¹³

Childhood Abuse and Violence

In addition to this context of change and volatility, research shows that abusive childhood experiences can trigger violent behavior. The American Academy of Pediatrics has identified several risk factors that can spark violence in adolescents, including being witness to domestic violence or substance abuse within the family, being poorly or inappropriately supervised, and being the victim of physical or sexual assault.¹⁴

Researcher Phyllis L. Crocker of Cleveland-Marshall College of Law has written that “the nexus between poverty, childhood abuse and neglect, social and emotional dysfunction, alcohol and drug abuse and crime is so tight in the lives of many capital defendants as to form a kind of social historical profile.”¹⁵

“The evidence now is strong that the brain does not cease to mature until the early 20s in those relevant parts that govern impulsivity, judgment, planning for the future, foresight of consequences, and other characteristics that make people morally culpable....”

Ruben Gur, MD, PhD
Director, University of
Pennsylvania Medical Center

Dr. Chris Mallett, Public Policy Director at Bellefaire Jewish Children’s Bureau in Ohio, recently completed the most comprehensive study of traumatic experiences in the lives of death row juvenile offenders to date.¹⁶ He found that:

- 74% experienced family dysfunction¹⁷
- 60% were victims of abuse and/or neglect¹⁸
- 43% had a diagnosed psychiatric disorder¹⁹
- 38% suffered from substance addictions²⁰
- 38% lived in poverty²¹

More than 30% of death row juvenile offenders had experienced six or more distinct areas of childhood trauma with an overall average of four such experiences per offender. Most children and adolescents do not face even one of these defined areas of difficulty.²² Mallett also found that such mitigating evidence was presented to juries in fewer than half of the offenders’ trials.²³

Mallett’s research confirmed findings in previous studies. In 1992, researchers found that two-thirds of all juveniles sentenced to death had backgrounds of abuse, psychological disorders, low IQ, indigence, and/or substance abuse.²⁴



Dr. Jay Giedd of the National Institute of Mental Health. Image courtesy of PBS Frontline report *Inside the Teenage Brain*.

In 1987, an investigation into 14 juveniles on death row²⁵ (40% of the total at the time) revealed that nine had major neuropsychological disorders²⁶ and seven had psychotic disorders since early childhood.²⁷ All but two had IQ scores under 90.²⁸ Only three had average reading abilities, and another three had learned to read only after arriving on death row.²⁹ Twelve reported having been physically or sexually abused, including five who were sodomized by relatives.³⁰

Delinquency Link

The turmoil often associated with adolescence can result in poor decisions and desperate behaviors. For example, studies have found that 20 to 30% of high school students consider suicide. Suicide is the third-leading cause of death among teenagers, occurring once every two hours, or over 4,000 times a year, according to the U.S. Surgeon General.³¹ Approximately 30% of youths reported using an illicit drug at least once during their lifetime, and 22.2% reported using an illicit drug within the past year.³²

Conclusion

New discoveries provide scientific confirmation that the teen years are a time of significant transition. They shed light on the mysteries of adolescence and demonstrate that adolescents have significant neurological deficiencies that result in stark limitations of judgment. Research suggests that when compounded with risk factors (neglect, abuse, poverty, etc.), these limitations can set the psychological stage for violence.

These discoveries support the assertion that adolescents are less morally culpable for their actions than competent adults and are more capable of change and rehabilitation. The ultimate punishment for minors is contrary to the idea of fairness in our justice system, which accords the greatest punishments to the most blameworthy.

This fresh understanding of adolescence does not excuse juvenile offenders from punishment for violent crime, but it clearly lessens their culpability. This concept is not new; it is why we refer to those under 18 as “minors” and “juveniles”—because, in so many respects, they are *less than adult*.

American Bar Association Juvenile Justice Center

Notes

¹ For an excellent overview, see Elkhonon Goldberg, *The Executive Brain: Frontal Lobes and the Civilized Mind*, Oxford University Press (2001).

² Sowell, Elizabeth R, Paul M. Thompson, Colin J. Holems, Terry L. Jernigan and Arthur W. Toga. *In vivo evidence for post-adolescent brain maturation in frontal and striatal regions*. 2 Nature Neuroscience 10 (1999), also Paus, Tomas, Jay Giedd, et. al. *Structural maturation of neural pathways in children and adolescents: in vivo study*. Science, 283 (1999).

³ Id.

⁴ Id.

⁵ Sowell, Elizabeth R, Paul M. Thompson, Kevin D. Tessner and Arthur W. Toga. *Mapping continued brain growth and gray matter density reduction in dorsal frontal cortex: inverse relationships during postadolescent brain maturation*, 21 Journal of Neuroscience 22 (2001), at 8819, also Reiss, A.L., et. al., *Brain development, gender and IQ in children, a volumetric imaging study*. Brain, 119 (1996).

⁶ PBS Frontline, *Inside the Teen Brain*. See *Interview with Jay Giedd*, online at www.pbs.org/wgbh/pages/frontline/shows/teenbrain/.

⁷ Id, at *Interview with Deborah Yurgelun-Todd*.

⁸ Id.

⁹ Gur, Ruben C. Declaration of Ruben C. Gur., PhD, *Patterson v. Texas*. Petition for Writ of Certiorari to US Supreme Court, J. Gary Hart, Counsel. (Online at: www.abanet.org/crimjust/juvjus/patterson.html)

¹⁰ Id.

¹¹ See Adams, Gerald R., Raymond Montemayor, and Thomas P. Gullota, eds. *Psychosocial Development during Adolescence*. Thousand Oaks, CA, Sage Publications (1996).

¹² Lewis, Melvin. *Child and Adolescent Psychiatry: A comprehensive textbook*, Lippincott Williams and Wilkins (2002).

¹³ See id, and Cobb, Nancy J. *Adolescence: Continuity, Change and Diversity*. Mayfield Publishing, CA (1998).

¹⁴ American Society of Pediatrics, *Policy Statement*, 1 Pediatrics, 103 (1999).

¹⁵ Phyllis L. Crocker. *Childhood Abuse and Adult Murder: Implications for the Death Penalty*, 77 NC L. Rev. 1143 (1999).

¹⁶ Mallett, Chris. *Socio-Historical Analysis of Juvenile Offenders on Death Row*, 3 Juv. Corr. Mental Health Report 65 (2003).

¹⁷ Id., at 77.

¹⁸ Id., at 78.

¹⁹ Id., at 77.

²⁰ Id., at 78.

²¹ Id.

²² Id.

²³ Id.

²⁴ Robinson, DA and Stephens, OH; *Patterns of mitigating factors in juvenile death penalty cases*, 3 Criminal Law Bulletin 28 (1992).

²⁵ Lewis, DO, Pincus, Bard, Richardson, Pritchep, Feldman, Yeager. *Neuropsychiatric, psychoeducational, and family characteristics of 14 juveniles condemned to death in the United States*, 5 Am. J. of Psychiatry 145 (1988).

²⁶ Id.

²⁷ Id.

²⁸ Id.

²⁹ Id.

³⁰ Id.

³¹ Office of the U.S. Surgeon General, *At a Glance, Suicide Among the Young*: Online at www.surgeongeneral.gov/library/calltoaction/fact3.htm

³² White House Office of National Drug Control Policy, *Juveniles and Drugs*, at www.whitehousedrugpolicy.gov/drugfact/juveniles/index.html

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Brain Maturity Extends Well Beyond Teen Years

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Under most laws, young people are recognized as adults at age 18. But emerging science about brain development suggests that most people don't reach full maturity until the age 25. Guest host Tony Cox discusses the research and its implications with Sandra Aamodt, neuroscientist and co-author of the book *Welcome to Your Child's Brain*.

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TONY COX, host: I'm Tony Cox and this is TELL ME MORE from NPR News. Michel Martin is away. We'd like to spend this part of the program talking about the passage from childhood to adulthood and how that may be tougher for one distinct group of young people.

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Most of the privileges and responsibilities of adulthood are legally granted by the age of 18. That's when you can vote, enlist in the military, move out on your own, but is that the true age of maturity? A growing body of science says, no. That critical parts of the brain involved in decision-making are not fully developed until years later at age 25 or so.

In a moment, we'll hear about how child advocates are hoping to use this research to

change the laws about their foster care. But first, to learn more about adolescent brain development and maturity, we are joined now by neuroscientist, Sandra Aamodt. She is the coauthor of the book, "Welcome to Your Child's Brain: How the Mind Grows from Conception to College."

Sandra, welcome to the program. It's nice to have you.

Dr. SANDRA AAMODT: It's nice to be here.

COX: Is this idea that the brains of 18 year olds aren't fully developed a matter of settled science?

AAMODT: Yes. The car rental companies got to it first, but neuroscientists have caught up and brain scans show clearly that the brain is not fully finished developing until about age 25.

COX: To not be too clinical in the spin that we put on this, what parts of the brain are we talking about and what changes happen between the ages of 18 and, let's say, 25?

AAMODT: So the changes that happen between 18 and 25 are a continuation of the process that starts around puberty, and 18 year olds are about halfway through that process. Their prefrontal cortex is not yet fully developed. That's the part of the brain that helps you to inhibit impulses and to plan and organize your behavior to reach a goal.

And the other part of the brain that is different in adolescence is that the brain's reward system becomes highly active right around the time of puberty and then gradually goes back to an adult level, which it reaches around age 25 and that makes adolescents and young adults more interested in entering uncertain situations to seek out and try to find whether there might be a possibility of gaining something from those situations.

COX: So this is important. Are the physiological changes in the brain, in terms of the development of young people, as significant and impactful as the cultural changes and environmental changes that they go through vis-a-vis peer pressure things of that sort?

AAMODT: Well, actually, one of the side effects of these changes in the reward system is that adolescents and young adults become much more sensitive to peer pressure than they were earlier or will be as adults.

So, for instance, a 20 year old is 50 percent more likely to do something risky if two friends are watching than if he's alone.

COX: Is there a difference between males and females with regard to their brain development, particularly in this age category?

AAMODT: Females' brains develop about on average two years earlier than male brains, so you're more likely to have a late developing male brain than female.

COX: So when females say they're smarter than guys, it really is true?

AAMODT: Especially around about the age of 15 or so. Yes.

COX: What does this mean? In a minute, we're going to be hearing from some advocates who think that the foster care system needs to be changed, in that in some states, when you reach the age of 18, you are booted out of foster care and their argument is based on some of the research that you are now citing that these young people are not really ready for the adult world.

What is the impact for someone who lives in a foster care kind of setting as far as their brain development is concerned?

AAMODT: One of the things that deprived childhood causes is problems with prefrontal cortex function, so somebody who has had an unstable home life is more likely to have trouble with planning and organizing behavior and with inhibiting impulses than somebody who has had a stable life.

COX: Would you say, based on the research that you are now citing, that it would make more sense to have the legal age become 25 instead of 18 or 21 in some cases?

AAMODT: I think it makes sense to have different ages for different functions. Obviously some 18 year olds are competent to go out into the world and handle things by themselves and some of them aren't. It would be nice if we had a little more flexibility to distinguish the two in the legal system.

COX: Final thing is, if these age limits are not adjusted to take into account the effect that the research has shown, what is the price - if I can put it that way - that society will end up paying down the road? I know that's a pretty large question. But another way of saying it is how important is it for us to address this and do something about it now?

AAMODT: Many of the costs of adolescents are actually - what we think of as the costs of adolescence, the risks of crime and car accidents and all the crazy things that adolescents do are actually more issues with young adults, people in the 18 to 25 age range, largely because they have more opportunities to get into these kinds of trouble because they have less parental supervision than the younger adolescents do.

COX: Sandra Aamodt is a neuroscientist and the co-author of "Welcome to Your Child's Brain: How the Mind Grows from Conception to College." She joined us from Capital Public Radio in Sacramento, California.

Sandra, thank you very much.

AAMODT: Thank you.

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